Indian Journal of Science and Technology Vol. 4 No. 8 (Aug 2011) ISSN: 0974- 6846

Vehicular growth and its management: Visakhapatnam city in India– A case study

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Abstract

Visakhapatnam urban development authority (VUDA) has a jurisdiction of 1721 sq. kms and covers a population of 22.02 lakhs. According to official records about 5 lakh vehicles are currently plying on Visakhapatnam roads. Total traffic volume in Visakhapatnam district was recorded as 4, 64,780 and 2, 63,646 were recorded in Visakhapatnam city, which is 56.72% of the total traffic volume of the district. In the absence of effective planning and traffic management of the city, the current road infrastructure cannot cater the future needs of the city mobility. At all the major junctions of the city, volumes of pedestrian and vehicular traffic increased significantly. In the present work it is proposed to study the traffic scenario at major junctions of Visakhapatnam city and necessary improvements are suggested to increase the mobility.

Keywords: Road, traffic, population, travel time, delays.

Introduction

Over the last few years, Visakhapatnam city has proven to the rest of the world through its fast paced growth and development in the country that it is destined for greater avenues and grand possibilities in terms of industrial development, tourism, life-style and culture. The industrialization and the accompanying urbanization are responsible for the rapid growth of the city. VUDA has prepared a master plan for 5 urban centers keeping 2021 in perspective and also the proposed developments in the region like Gangavaram port, special economic zone (SEZ), Pharma city, Apparel park, industrial development, education, health, housing and tourism etc., In the present study master plan perspective-2021 (Draft final report) is taken as reference.

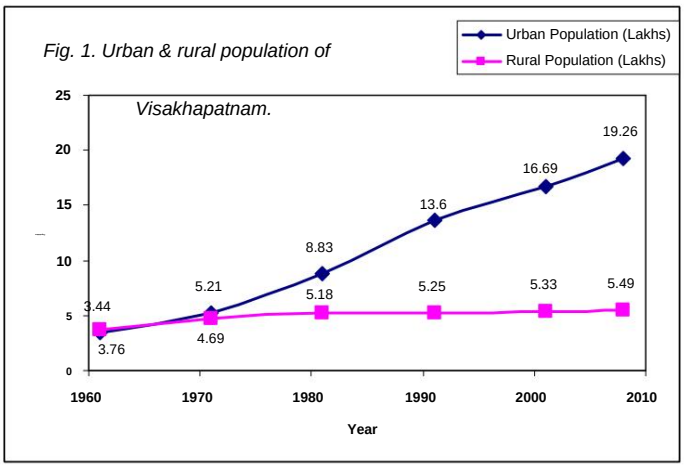

Fig. 1. Urban & rural population of

Regional & population growth

The Visakhapatnam city having a number of large and medium industries with their activities located in and around the city limits. The eastern navel command, navel dockyard, ship building centre, and division navel head quarters of the south eastern railway accompanied by scores of small and medium ancillary industries, business, trade and commerce have contributed to the fast growth of Visakhapatnam urban region. The population in both urban and rural areas observed same in early 60s and the urban population growth is much higher than rural population in recent times as shown in Fig.1. The dynamic growth in the economy of the region is accompanied by the rapid growth of the population has resulted in gross inadequacies in infrastructural services.

In the absence of effective planning and traffic management of the city, the current road infrastructure cannot cater the future needs of the city traffic (Arasan & Koshy, 2005).

Vehicle population & its growth

According to official records 7 lakh vehicles are currently plying on the Visakhapatnam roads. The traffic volume of Visakhapatnam city is about 59% of the total traffic volume of the district. The vehicle population data for Visakhapatnam city is shown in Table 1.

Road infrastructure

Currently the city road density is 2.2 km/Sq. km; 70.56 km/lakh population. The national highways (5 & 43) run through the region and connect important places of the city and district. The region is on the golden quadrilateral of national highway development program (NHDP).

National Highway 5 (Chennai-Howrah with a total length of 1014 Km) is passing through Anakapalli and Visakhapatnam. National highway 43 (Raipur – Sunki – Salur – Gajapathinagaram–Vizianagaram road) linked to NH-5; northwards connect the Vizag city with Vizianagaram. State highways (SH 38 &39) also pass through the city which connect the city towards north to

Table 1. Vehicular strength in Visakhapatnam urban area.

Class of vehicle 2003 2006 2007 Two wheelers 148285 165153 181613 194122						2008
206911 220830						
Cars	17171 19528 22243 25480 29616 33554					
records	9277	9458 9763 10766 12304 13622				
Cabs/Jeeps 3138		3493	3978	4475	5142	5721
APS RTC (Buses) 491		495	521	543	553	567

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Kirandol (SH 39) and tangential link (SH 38) connects Anakapalli–Pendurthi – Anandapuram – Bheemili. In addition to these outer major roads, there are several internal arterials and sub-arterials which carry major part of the city traffic and almost reached their capacities

(Chandra Satish, 2000).

Project methodology

In the present work, it is proposed to study the improvement of traffic movement along railway station road, RTC bus stand, Sangam Sarat junction and Asilimetta. Based on the available data the options for easing traffic improvement at above 3 junctions are: Rerouting bus movement, One-way circulation movement, Under pass at Asilmetta and RTC junctions

and Flyover between Asilmetta and Sangam Sarat junction and under pass at Asilmetta and RTC junction.

The economic justification of the project results from: savings in vehicle operation cost (VOC), savings in travel time, savings in stopped delay and savings in idle fuel consumption.

Table 2. Traffic volumes with peak hour traffic

Junction	Peak traffic pcu/h	Peak hour
Siripuram	9623	18:45 – 19:45
Asilmetta	9339	09:45 – 10:45
RTC	10130	12:00 – 13:00
Sangam Sarat	8116	18:45 – 19:45

Traffic scenario

The existing traffic volume with peak hour traffic for the corridor is presented in Table 2. The traffic flow pattern has been studied in the corridor and presented in Fig. 2 to Fig. 4.

Traffic composition

Two wheelers & autos (79%); Cars & LCVs (13%); Buses and mini buses (6%) (Justo & Tuladha,1984). The traffic congestion in the corridor due to: on street parking, haphazard pedestrian movement and bus traffic–to & from RTC.

Origin-destination (O-D) study analysis

The O-D survey has been conducted at all junctions of the corridor; desire lines are drawn and presented in Fig. 5.

Proportion of traffic from O-D analysis

Railway station to Siripuram – 46%; Railway station to Rednam – 28%; Railway station to diamond park – 17%; Siripuram to railway station – 39%; Siripuram to diamond park – 17%; Siripuram to national highway – 25%; Ramatalkies to Rednam – 48%; Ramatalkies to railway station– 32%; Ambedkar junction to diamond park – 40%; Diamond park to Ambedkar junction–22%. The present and proposed traffic movement (Khan & Maini, 2000) for the corridor is shown in Fig. 6 and Fig. 7. Among various options considered for traffic movement improvement, the option of constructing a flyover and two under passes one at the RTC junction and the other at Asilmetta junctions are proposed.

Due to the proposed grade separator, road users experience savings in travel time due to uninterrupted

Fig. 2. Traffic flow at Asilmetta junction.

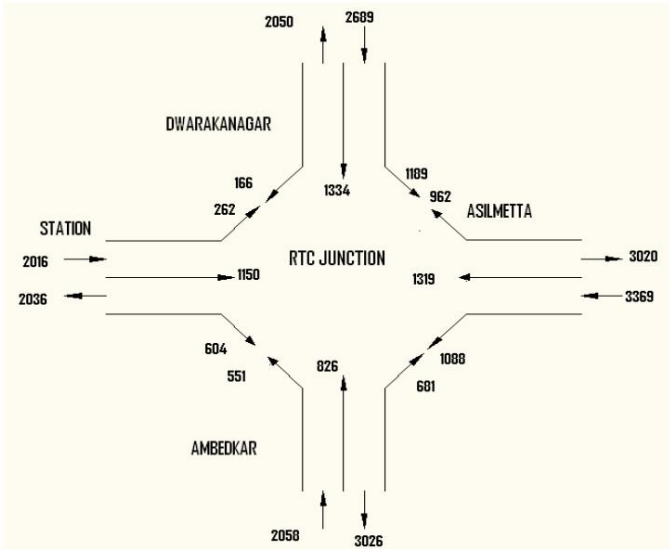

Fig. 3. Traffic flow at RTC junction.

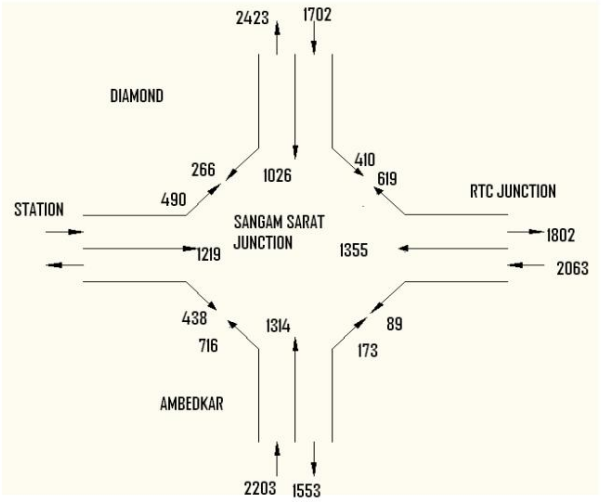

Fig. 4. Traffic flow at Sangam Sarat junction.

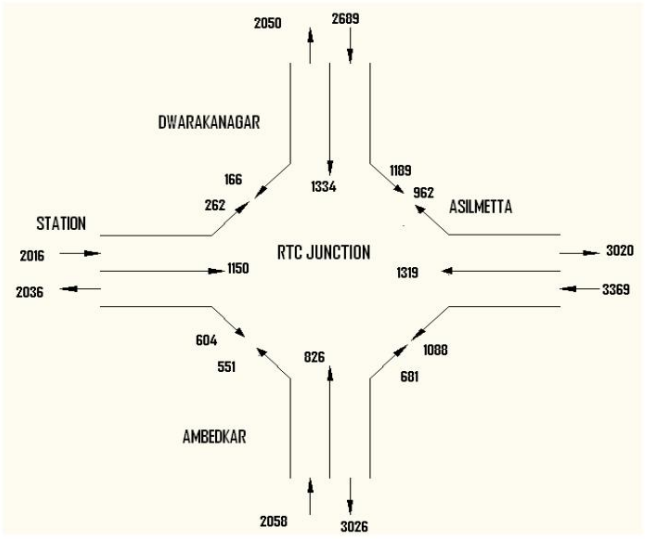

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Fig. 5. Origin-destination pattern at Asilmetta–Railway station corridor

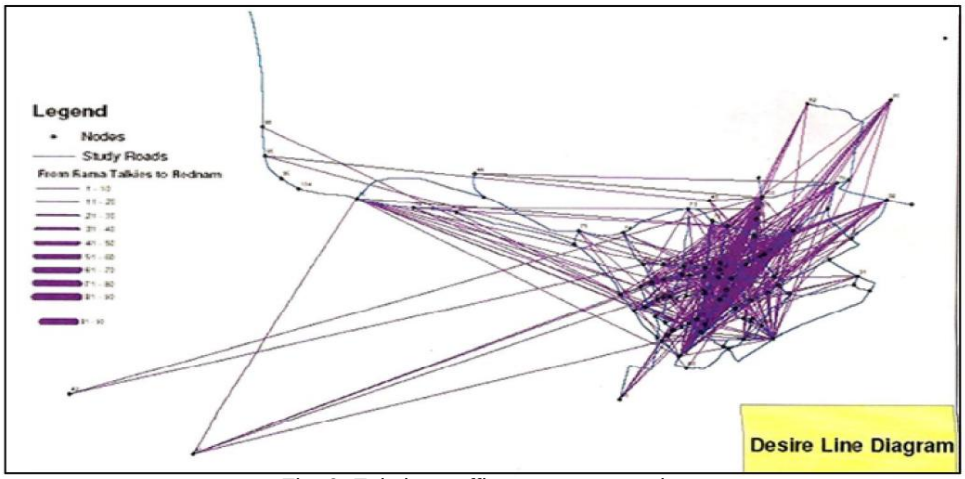


Fig. 6. Existing traffic movement on the Asilmetta-Railway station corridor.

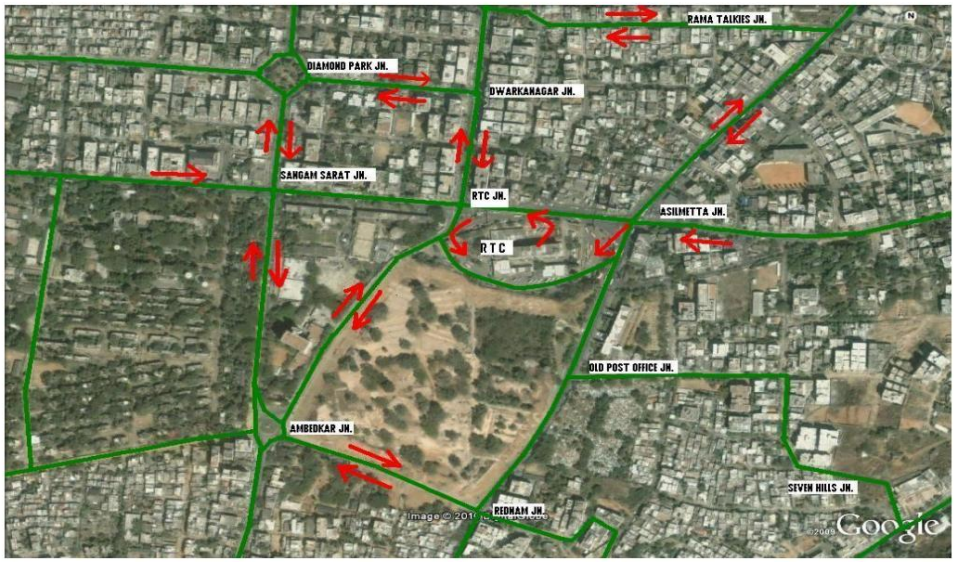
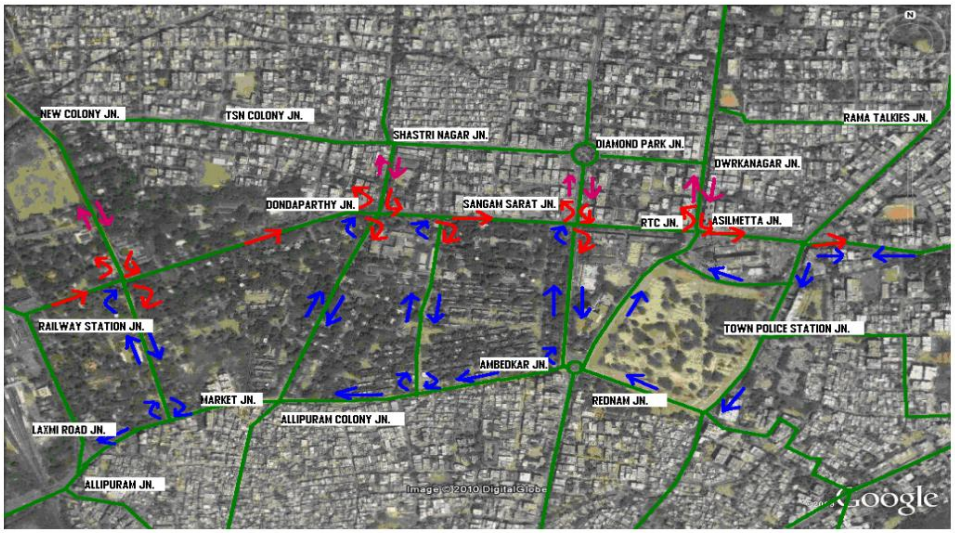


Fig.7. Proposed traffic movement on the Asilmetta-Railway station corridor.



flow over the grade separator and improved running speeds on the approach roads. There will be substantial reduction in stopped delays at the intersection as result of reduced signal timings for the at grade traffic. Stopped delays for at grade traffic was estimated considering a four –phase single arm clearance signal system at the Sangam Sarat junction. The movement of traffic on the corridor between RTC junction and Asilmetta junction is converted to be a one way hence eliminating the delay at the intersection due to nullified crossing conflicts.

Benefits

The estimated benefits for the study area during peak hour have been calculated to the average hour values and further to the 24 h period values considering the hourly distribution of traffic. Savings due to the fuel consumed by a vehicle during the stopped delay time (Idle fuel consumption savings) will be reduced and the same was assessed as suggested by central road research institute (CRRI), New Delhi (Table 3).

Travel time

The savings in travel time due to increased running speeds because of construction of flyover would be of the order of about 23 sec at present and is likely to increase to about 27 sec by 2015 and to about 33 sec by 2027.

Monetary savings

Monetary savings due to various benefits–vehicles operating cost, reduced stopped delay, travel time and idle fuel consumption were estimated per day considering the factor derived based on the hourly variation of traffic through the study intersection (Table 4). Urban traffic is consistent across different weekdays and months.

Conclusions

Due to the rapid development of Visakhapatnam city as an industrial and IT hub, there is a need to improve the existing traffic management system for the entire city. Railway station–Asilmetta

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Table. 3. Estimated average delay savings (seconds) per signal cycle

Junction		Arms of the Intersection			
Asilmetta		To Siripuram	To Jagadamba	To Rama talkies	To RTC
	Existing	59.86	51.26	35.37	45.63
	Proposed	11.52	10.48	8.67	10.55
RTC Junction		To Asilmetta	To Dwarka Nagar	To Daba Gardens	To Station
	Existing	38.89	48.01	51.26	52.92
	Proposed	12.38	17.93	13.44	16.10
Sangam Sarat Junction		To Station	To Diamond Park	To Daba Gardens	To RTC
	Existing	60.75	34.00	30.00	43.00
	Proposed	15.43	22.23	18.36	28.54

Table 4. Yearly Monetary Savings (Rs. In Lakhs)

Year	Delay VOC 303	Travel Time	IFC		Total
2007		325	91	671	1390
2015	601	705	181	1249	2736
2027	1330	1704	402	2617	6052

corridor is considered as the city's centre for various operations related to business, education and recreational facilities, the traffic movement and management of this corridor should be given utmost priority. Among various options considered for improvement of this corridor, the option of constructing flyover and two vehicular under passes one at RTC and other at Asilmetta junctions is proposed which will relieve the traffic congestion at 3 major junctions. As some part of the traffic use the grade separator, road users experience savings in travel time due to uninterrupted movement at flyover and at the grade separator thereby improving running speeds on the approach roads.

Acknowledgements

Authors are thankful to the Head of the Department and Principal, GITAM University, Visakhapatnam for their encouragement and support extended. Authors are also thankful to the Visakhapatnam police for extending their help during field studies.

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